

WHAT IS CLAIMED IS:

1. A sputtering apparatus comprising a vacuum chamber, a cylindrical substrate holder supported rotatably in the vacuum chamber and a substrate mounted on an outer periphery of the substrate holder wherein the vacuum chamber includes a first film deposition area and a second film deposition area for deposition of a film on the substrate, the first film deposition area includes a first sputtering source comprising a first cathode and a first target held on the first cathode and a first plasma generator located so as to be adjacent to the first sputtering source, and the second film deposition area includes a second sputtering source comprising a second cathode and a second target held on the second cathode and a second plasma generator located so as to be adjacent to the second sputtering source, and the first sputtering source and the first plasma generator are partitioned from each other and the second sputtering source and the second plasma generator are partitioned from each other.
2. The sputtering apparatus according to Claim 1, wherein the first cathode and/or the second cathode comprises a pair of cathodes to which a discharge voltage is alternately applied from an AC power source or a DC pulse power source.
3. The sputtering apparatus according to Claim 1, wherein a shutter means is provided so as to be opened

and closed with the same angular position with respect to the first cathode and the second cathode.

4. The sputtering apparatus according to Claim 1, wherein the first plasma generator and/or the second plasma generator is a plasma generator for generating plasma by a microwave discharge or an inductive or capacitive coupling type high frequency discharge.
5. A sputtering apparatus comprising a vacuum chamber, a circular disk-like substrate holder supported rotatably in the vacuum chamber and a substrate mounted on the circular disk of the substrate holder wherein the vacuum chamber includes a first film deposition area and a second film deposition area for deposition of a film on the substrate, the first film deposition area includes a first sputtering source comprising a first cathode and a first target held on the first cathode and a first plasma generator located so as to be adjacent to the first sputtering source, and the second film deposition area includes a second sputtering source comprising a second cathode and a second target held on the second cathode and a second plasma generator located so as to be adjacent to the second sputtering source, and the first sputtering source and the first plasma generator are partitioned from each other and the second sputtering source and the second plasma generator are partitioned from each other.

6. The sputtering apparatus according to Claim 5,

wherein the first cathode and/or the second cathode comprises a pair of cathodes to which a discharge voltage is alternately applied from an AC power source or a DC pulse power source.

5 7. The sputtering apparatus according to Claim 5, wherein a shutter means is provided so as to be opened and closed with the same angular position with respect to the first cathode and the second cathode.

10 8. The sputtering apparatus according to Claim 5, wherein the first plasma generator and/or the second plasma generator is a plasma generator for generating plasma by a microwave discharge or an inductive or capacitive coupling type high frequency discharge.

15 9. A mixed film characterized by being formed on a substrate by using the sputtering apparatus described in Claim 1 and by repeating the following operations:

20 depositing on the substrate a film of a material for the first target, by sputtering at the first sputtering source, causing a reaction of the formed film by the first plasma generator, depositing a film of a material for the second target, by sputtering at the second sputtering source, and causing a reaction of the formed film by the second plasma generator.

10. A multilayer film including the mixed film described in Claim 9.

25 11. A mixed film characterized by being formed on a substrate by using the sputtering apparatus described in

Claim 5 and by repeating the following operations:

depositing on the substrate a film of a material for the first target, by sputtering at the first sputtering source, causing a reaction of the formed film by the 5 first plasma generator, depositing a film of a material for the second target, by sputtering at the second sputtering source, and causing a reaction of the formed film by the second plasma generator.

12. A multilayer film including the mixed film described 10 in Claim 11.